

# Health Consultation

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Review of Community Drinking Water and Health Outcome Data in  
Response to Community Requests of Residents Near the

Georgia-Pacific Corporation Crossett Paper Operations  
100 Mill Supply Road  
Crossett, Ashley County, Arkansas 71635

EPA Identification Number: ARD035466648  
AFIN Number: 02-00013

**Prepared by**  
**Arkansas Department of Health**

JUNE 6, 2016

Prepared under a Cooperative Agreement with the  
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES  
Agency for Toxic Substances and Disease Registry  
Division of Community Health Investigations  
Atlanta, Georgia 30333

## **Health Consultation: A Note of Explanation**

A health consultation is a verbal or written response from ATSDR or ATSDR's Cooperative Agreement Partners to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR or ATSDR's Cooperative Agreement Partner which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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## SUMMARY

### INTRODUCTION

The Arkansas Department of Health (ADH) first became involved with this site at the request of the U.S. Environmental Protection Agency (EPA) Region 6 Director. Specifically, EPA requested assistance with addressing community concerns about water, air, and cancer statistics. ADH has since been involved with helping the community of Crossett understand environmental issues about the water and air, and the potential public health effects of living near the wastewater treatment facility owned by Georgia-Pacific Corporation (GP). In this document, drinking water samples and cancer statistics were evaluated and water data were reviewed from the community to determine if potential exposure risks exist. A separate document will review air monitoring data for this community.

### CONCLUSION 1

ADH and ATSDR conclude that substances (analytes) present in the public drinking water systems are not expected to harm people's health and pose no risk to public health. The exposure pathway for drinking water is eliminated since no contamination has been detected at levels of public health concern in the drinking water supplies.

### BASIS FOR DECISION

After a review of the groundwater monitoring data, the public drinking water system data (as regularly reported and regulated by the Safe Water Drinking Act), and residential tap water data, there is no evidence of any compound exceeding levels likely to cause public health concern. Therefore, exposure to drinking water it is not expected to harm people's health.

### CONCLUSION 2

ADH and ATSDR conclude there is no significant difference to indicate elevated cancer cases for Ashley County as compared with the state of Arkansas.

### BASIS FOR DECISION

Health outcome data were evaluated to determine cancer incidence rates and leading causes of death for Ashley County as compared with the state of Arkansas [See Appendices]. No statistically significant difference was found for elevated cancer cases when comparing Ashley County to the state. County level data may be a limitation in this type of analysis given that the size of the potentially exposed population is likely to be much smaller than the county level population. However, due to the population density of Ashley County, mostly residing in and surrounding the Crossett area, the rates for the county are likely representative of the population in and around Crossett.

**NEXT STEPS**

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ADH and ATSDR will continue to evaluate future environmental data, assist federal and state agencies, educate the public, and address community members' requests or concerns in regards to this site.

**FOR MORE  
INFORMATION**

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If you have concerns about your health, you should contact your health care provider. You can also call ATSDR at 1 – 800 – CDC – INFO, or ADH at 501-661-2936 and ask for information on the Georgia-Pacific Corporation Crossett Paper Operations data review.

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## **Statement of Issues**

The U.S. Environmental Protection Agency (EPA) Region 6 requested assistance from the Arkansas Department of Health (ADH) with addressing community concerns about water, air, and cancer statistics in Crossett, Arkansas. Since February 2012, ADH has been involved with helping the community of Crossett understand environmental issues about the water, air, and potential health effects of living near the wastewater treatment facility owned by Georgia-Pacific Corporation (GP). In this document, drinking water samples and cancer statistics were evaluated from the community surrounding GP paper mill and wastewater treatment facility in Crossett, Arkansas. A separate document will review air monitoring data. This health consultation was prepared under a cooperative agreement funded by the Agency for Toxic Substances and Disease Registry (ATSDR). Data were reviewed to determine if potential exposure risks exist.

## **Background**

The GP site is located in Crossett, Ashley County, Arkansas, and is approximately ten miles north of the Louisiana border. Originally, the GP site was founded in 1899 as the Crossett Lumber Company. The first kraft paper machine was installed on-site in 1937. GP purchased the site in 1962, and currently owns the facility. Today, the GP site includes a paper mill, plywood mill (currently inactive), and two chemical plants [1]. The complex is large; roughly 1.5 miles (east/west) by 1 mile (north/south) in size, and operations run continuously, 24 hours per day, 7 days per week, 52 weeks per year [2]. According to GP, it employs approximately 1,400 people at the Crossett facility [1].

The 2012 U.S. Census Bureau estimates Crossett, Arkansas, has a population of 5,411 residents. Of the total population, approximately 55% are white, 43% are African American, and 2% are Hispanic. Approximately 24% of the population is under 18 years old, while approximately 19% of the total population is over the age of 65. During 2008 - 2012, the median household income was \$33,797. In Crossett, the population living below poverty level is approximately 16% [3].

For several years, the EPA Region 6 has received complaints from residents in one of the Crossett neighborhoods in close proximity to the GP paper mill and wastewater treatment facility; chief complaints have focused on air emissions and water discharges from the GP paper operations. The EPA Deputy Regional Administrator (DRA) and staff from the EPA Office of Environmental Justice and Tribal Affairs (OEJTA) visited Crossett on February 22, 2014. The purpose of the visit was to participate in a tour of the community and a community meeting at the request of a resident representing the local activist group 'Concerned Citizens for Environmental Justice'. Also, in February 2014, representatives from the EPA Region 6 Compliance Assurance and Enforcement Division (or CAED) performed a site inspection of the

GP wastewater treatment system and the facility's landfills. No areas of concern were identified in this inspection [2].

## Discussion

### Exposure Pathway

Community members were concerned about wastewater treatment discharges and surface waters impacting the drinking water supply. Drinking water samples were reviewed to determine if any contaminants of concern (COCs) have been detected in the community's tap water.

Groundwater monitoring well data were also reviewed. Evaluating the health effects of exposure to hazardous chemicals requires both extensive knowledge of exposure pathways and access to toxicity data. Exposure to hazardous chemicals is determined by examining human exposure pathways. An exposure pathway has five parts:

1. A source of contamination (e.g., hazardous compound(s) from a processing plant or wastewater treatment facility),
2. An environmental medium such as water (or air, or soil) that can hold or move the contamination,
3. A point at which people come in contact with a contaminated medium such as a drinking water from a public water facility,
4. An exposure route, such as ingestion of contaminated water, and
5. A population who could come in contact with the contaminants, such as the Crossett community.

An exposure pathway is eliminated if at least one of the five parts is missing and will not occur in the future. For a completed pathway, all five parts must exist and exposure to a contaminant must have occurred, is occurring, or will occur. The Arkansas Department of Environmental Quality (ADEQ) oversees a groundwater monitoring system relative to the solid waste landfills operated by GP. These landfills are located on-site near the area of the wastewater treatment facility. ADEQ provided ADH the groundwater monitoring data collected from 2012 - 2014 [4].

These groundwater monitoring wells are located within the GP Crossett Class 3N Landfill. As indicated by water level measurements from previous years, the groundwater within the uppermost aquifer consistently flows to the south-southeast (last reported in Fall 2014) [4]. The groundwater collected from nine monitoring wells are routinely tested for chloride, fluoride, nitrate, sulfate, total organic carbon, dissolved solids, arsenic, barium, chromium, iron, lead, manganese, zinc, and benzene [4]. ADH reviewed the groundwater monitoring data and found no elevated concentrations above health comparison values for all appropriate analytes evaluated.



Constituents from the GP Chemical Plant effluent were included in an EPA Resource Conservation and Recovery Act (RCRA) Compliance Evaluation Inspection Report and were considered as part of the potential exposure pathway. Constituents that can be found in the GP Chemical Plant effluent include: methanol, formaldehyde, phenol, benzene, toluene, methyl ethyl ketone, acetaldehyde, cyclopentanone, cresols, chromium, and ammonia. According to the RCRA report, surface water concentrations were detected below regulatory limits [2]. Public drinking water data and private tap water data were also reviewed for public health purposes in order to address community concerns.

#### Public Drinking Water Review

When the EPA became involved with this community request, it performed an internal review to further examine the public drinking water supply in Crossett. Five public water systems are in the area: Crossett Water Commission; North Crossett Utilities; Northeast Crossett Water Association; West Ashley County Water Association; and Georgia Pacific Water – Paper Mill [5].

EPA Region 6 also conducted a review of the drinking water wells utilized by Crossett Water Commission, North Crossett Utilities, and Georgia Pacific Corporation – Paper Mill and has determined that each water system is obtaining its drinking water from a confined aquifer (*i.e.*, an aquifer that is sealed above and below by impermeable material.) Crossett Water Commission and North Crossett Utilities use water from the Cockfield Formation Aquifer whereas Georgia Pacific Corporation – Paper Mill utilizes water from the Sparta Aquifer. In addition, the source water wells for these water systems are located to the north for North Crossett Utilities and to the southeast for Crossett Water Commission and Georgia Pacific Corporation – Paper Mill. According to EPA's report, the storm water drainage from the Georgia Pacific Corporation – Paper Mill travels in a southeastern direction, but upon entry into Coffee Creek the flow direction is to the southwest and away from the plant. This drainage is not near any public water supply drinking water well and shows no impact to the confined aquifers [5].

At the request of EPA, the ADH Engineering Division also reviewed all five public water systems in the Crossett area. The ADH Engineering Division's primary function is the regulation and oversight of public water systems throughout the state of Arkansas, and ADH reviews all public drinking water systems of the state on a monthly and quarterly basis. Both EPA and ADH evaluated the compliance drinking water data separately. ADH reviewed water reports from 2003 – 2014, and laboratory analytes included benzene, bromoform, dibromochloromethane, diethyl phthalate, and methyl tert-butyl ether (MTBE) [6]. No elevated levels of regulated drinking water analytes for semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), or disinfection by-products (DBPs) were detected in these data [5]. Based on the review of these public drinking water systems data from Crossett, both

EPA and ADH Engineering Division have determined that there is no exceedance of public drinking water regulations or standards. These drinking water systems are in compliance with all State and Federal drinking water regulations. There is not expected to be any adverse health effects due to exposure or ingestion through the drinking water pathway [5, 6].

At the request of ADH physicians, other contaminants, not considered as regulatory analytes for federal drinking water standards, were examined because they have been linked to hypertension and strokes. These were examined due to the high stroke rate in Ashley County (as detailed in the health outcome data section). Sodium and magnesium are sometimes found as naturally occurring metals in the drinking water. Neither sodium nor magnesium are regulated by the Safe Drinking Water Act. However, the ADH Engineering Division regularly reviews inorganic sample results of the public water systems for sodium and magnesium. Should the sodium level be reported above 20 parts per million (ppm), ADH Engineering Division has traditionally encouraged the public water systems personnel to inform local physicians that the drinking water may be a small contributor to overall sodium intake. The health-based value of 20 ppm is the EPA Drinking Water Equivalent Level (or DWEL) for individuals on a 500 milligrams (mg) per day *restricted* sodium diet [7].

As reported by the ADH Engineering Division, sodium levels in the state, overall, average about 48 ppm. Sodium levels vary depending upon the source water. Assuming a daily intake of 2 liters of water per day (the standard EPA default value), the sodium contribution from water with a concentration of 48 ppm would be 96 mg per day. Although this would add to a person's daily intake of sodium, it is significantly less than the sodium-*reduced* diets that are typically 1,000 to 3,000 mg per day [8]. Average daily intake for Americans is likely between 4,000 and 6,000 mg. People with high blood pressure who may be on a salt-restricted diet may consider discussing this amount of sodium in their water with their family physician [9, 10]. Residents utilizing drinking water from the Crossett Water system or the North Crossett Utilities system should take note of the specific sodium levels reported and adjust their sodium intake, as necessary.

The most recent sodium level results in Ashley County (as submitted by ADH Engineering personnel) are as follows. The different concentrations reflect the different wells in use.

The public water systems utilized by the Crossett community (as compared to the other communities within the county) are bolded and underlined.

- **Crossett Water, 66.8 ppm, daily sodium contribution = 133.6 mg**
- **North Crossett Utilities, 135 ppm, daily sodium contribution = 270 mg**
- Parkdale Water, 34.4 ppm, daily sodium contribution = 69.2 mg
- Portland Water, 28.9 ppm, daily sodium contribution = 57.8 mg
- Wilmot Water, 150 ppm, daily sodium contribution = 300 mg

- Fountain Hill Water, 202 ppm, daily sodium contribution = 404 mg
- Hamburg Water, 35 ppm, daily sodium contribution = 70 mg
- Boydell Water, 323 ppm, daily sodium contribution = 646 mg
- Montrose Water, purchased from Portland, 28.9 ppm, daily sodium contribution = 57.8 mg
- **North East Crossett Water, purchased from North Crossett, 135 ppm, daily sodium contribution = 270 mg**
- **West Ashley County, purchased from Crossett, 66.8 ppm, daily sodium contribution = 133.6 mg**

Magnesium is typically found in much lower amounts. The statewide average is approximately 7 ppm. The most recent magnesium level results in Ashley County (as submitted by ADH Engineering personnel) are as follows. The different concentrations reflect the different wells in use.

The public water systems utilized by the Crossett community (as compared to the other communities within the county) are bolded and underlined.

- **Crossett Water, 12.8 ppm, daily magnesium contribution = 25.6 mg**
- **North Crossett Utilities, 1.52 ppm, daily magnesium contribution = 3.04 mg**
- Parkdale Water, 8.01 ppm, daily magnesium contribution = 16.02 mg
- Portland Water, 10.3 ppm, daily magnesium contribution = 20.6 mg
- Wilmot Water, 3.46 ppm, daily magnesium contribution = 6.92 mg
- Fountain Hill Water, <1 ppm, daily magnesium contribution = <2 mg
- Hamburg Water, 13.3 ppm, daily magnesium contribution = 26.6 mg
- Boydell Water, 3.51 ppm, daily magnesium contribution = 7.02 mg
- Montrose Water, purchased from Portland, 10.3 ppm, daily magnesium contribution = 20.6 mg
- **North East Crossett Water, purchased from North Crossett, 1.52 ppm, daily magnesium contribution = 3.04 mg**
- **West Ashley County, purchased from Crossett, 12.8 ppm, daily magnesium contribution = 25.6 mg**

EPA regulations that cover public drinking water systems do not apply to privately owned wells. In accordance with the national regulations, ADH does not monitor individual or privately owned wells. As a result, owners of private residential wells are responsible for ensuring that their well water is monitored for potential contaminants, as well as proper maintenance and

treatment for their well. However, ADH is not aware of any private drinking water wells in the area. Generally, when public drinking water supplies are available within a city limit, use of private drinking water wells are less likely. Although drinking water wells used by the public water systems were reviewed, no private drinking water wells from individual residences were evaluated as part of this health consultation.

#### Private Residential Tap Water Review

Aside from public water systems, EPA reviewed water data collected by a community group at their request. The water samples collected by the group were from an individual residential tap on public water. Water sample results from the Ouachita Riverkeeper Report were reviewed by EPA scientists in March 2014. The analytes evaluated were: acetone, benzene, benzyl butyl phthalate, bis (2-ethylhexyl) phthalate, bromoform, dibromochloromethane, diethyl phthalate, phenol, and MTBE. In all samples, EPA determined that detected compounds were not currently at levels of health concern and/or not expected to cause any adverse effects [11].

EPA sent ADH a copy of this same laboratory analysis. The analysis was commissioned by the community group, Ouachita Riverkeeper, who also did the collection (rather than regulatory or contracted personnel) [11]. The laboratory data were comprised of an individual tap water sample collected from a residence on Roberts Road in Crossett, AR (Note: The laboratory's sample ID was Roberts Road with a house number and name attached.) Roberts Road is approximately 1.5 miles from the GP site. See Appendix A for location figure.

The laboratory analysis (Project #594466) was performed by Ana-Lab Corp. of Kilgore, TX. Samples were collected December 8, 2012, by a representative for the Ouachita Riverkeeper, and the Ana-Lab Corp. Chain of Custody documents the samples were received by the company on December 11, 2012. All samples summarized in this report were taken from tap water from a residence on Roberts Road (the tap water is supplied from one of the Crossett public water supply systems). Four laboratory tests (using the corresponding EPA test method) were performed for this sample set: semi-volatile hydrocarbons by EPA Method 625; liquid-liquid extraction by EPA Method 625; volatiles by gas chromatography/mass spectrometry (GC/MS) by EPA Method 624; and formaldehyde expansion by EPA Method 1667 [11]. Table 1 list the potential COCs from this sample collection, along with the corresponding reported laboratory concentrations and the ATSDR Health Comparison Value (HCV) specific to drinking water [12].

HCVs are chemical and media-specific concentrations in drinking water, air, and soil that are used by ATSDR to identify environmental contaminants that require further evaluation. HCVs incorporate assumptions of daily exposure to the chemical. HCVs are conservative and non-site specific. HCVs are based on health guidelines with uncertainty or safety factors applied to ensure that they are adequately protective of public health [12].

Of the compounds tested, three (bromoform, dibromochloromethane, and phenol) were identified, but their concentrations could not be verified because the levels were below the method-specified detection limit. Five compounds have laboratory concentrations that fall well below the HCVs for drinking water [acetone, benzyl butyl phthalate, bis (2-ethylhexyl) phthalate, diethyl phthalate, and MTBE]. Because the sample readings are lower than the HCV screening levels, no further analysis or theoretical risk calculations are needed for these compounds. However, one compound was reported at a concentration slightly higher than the HCV [benzene]. The review of water reports from all five public water systems in the Crossett area from 2003 – 2014 by the ADH Engineering Division revealed that benzene was not detected (*i.e.*, 0 µg/L) during any of the monitoring periods. The same review revealed that MTBE was detected once in February 2003 at the North Crossett Utilities at a concentration of 0.36 µg/L; however, since 2003, all MTBE concentrations have been reported as non-detect (0 µg/L) [6].

#### *Benzene Exposure Calculations*

Benzene, a widely used chemical, is a colorless liquid with a sweet odor. It evaporates into the air very quickly and dissolves slightly in water. It is highly flammable and is formed from both natural processes and human activities. Eating or drinking foods or water containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, and rapid heart rate. Long-term exposure to high levels of benzene in the air can cause leukemia, particularly acute myelogenous leukemia, often referred to as AML. This is a cancer of the bloodforming organs. The Department of Health and Human Services (DHHS) has determined that benzene is a known carcinogen. The International Agency for Research on Cancer (IARC) and the EPA have also determined that benzene is carcinogenic to humans. However, no information has been studied regarding the oral carcinogenicity of benzene in humans; typically, the skin and lungs are the main routes of benzene exposure [13].

Children can be affected by benzene exposure in the same ways as adults. It is not known if children are more susceptible to benzene poisoning than adults. Benzene can pass from the mother's blood to a fetus. There are no studies regarding reproductive effects in humans after oral exposure to benzene. Animal studies have shown low birth weights, delayed bone formation, and bone marrow damage when pregnant animals breathed benzene. Benzene exposure can be reduced by limiting contact with gasoline and cigarette smoke. Families are encouraged not to smoke in their house, in enclosed environments, or near their children because benzene is a component of cigarette smoke [13].

A reported concentration of 0.67 µg/L of benzene was used in theoretical risk calculations to find a daily exposure dose, hazard quotient (HQ), and potential cancer risk (CR), since this concentration was slightly above the benzene HCV of 0.64µg/L. Using the recommended EPA Exposure Factors Handbook range of age-specific drinking water intake rates and body weights for children (birth – 21 years) and adults (21 years and older), various estimated daily doses of

benzene through water ingestion were calculated [14]. The highest dose using the benzene exposure point concentration was 0.000096 mg/kg/day [milligrams per kilogram per day].

To put the calculated exposure doses into a meaningful context for non-cancer effects, the HQ was calculated for each potentially exposed child or adult. An HQ is the average daily intake divided by a chemical specific oral reference dose (RfD) set by the EPA. If the HQ for a chemical is equal to or less than one, it is believed that there is no appreciable risk that non-cancer health effects will occur. If the HQ exceeds one, there is some possibility that non-cancer effects may occur, although an HQ above one does not indicate an effect will definitely occur. This is because of the margin of safety inherent in the derivation of all RfD values. The larger the HQ value, the more likely it is that an adverse effect may possibly occur. The highest calculated HQ for ingestion was 0.2. Because the calculated HQ is less than one, ingestion of drinking water is not expected to harm people's health.

Since benzene is considered a carcinogen, a potential CR was calculated for all age groups. For CR ranges, potential risks greater than one in 1,000,000 (or  $1 \times 10^{-6}$ ), which likely represents no *excess* cancer risk, but less than one in 10,000 (or  $1 \times 10^{-4}$ ) are within the EPA's target risk range and considered an adequate level of health safety. If the additional lifetime cancer risk is greater than one in 10,000 (or  $1 \times 10^{-4}$ ), it is generally considered an indicator that further evaluation may be warranted if the source of contamination is not removed. The highest calculated CR for ingestion was  $4.8 \times 10^{-7}$  (the combined CR for all children exposed for 21 years). This worst-case scenario model falls below the target risk range, and therefore the reported benzene concentration is not expected to harm people's health. See Table 2 for a summary of theoretical risk calculations.

**Table 1.** Reported Contaminant Concentrations in Tap Water Samples from a Residential Location in Crossett, AR and Analyzed by Ana-Lab Corp. (December 2012)

Compound	Reported Concentration (µg/L)	Lab Indicator	ATSDR HCV (µg/L)
Acetone	5.50	-	9,000 child RMEG
			32,000 adult RMEG
Benzene	<b>0.67</b>	J	0.64 CREG
Benzyl butyl phthalate	4.71	B	2,000 child RMEG
			7,000 adult RMEG
Bis(2-ethylhexyl)phthalate	15.6	B	6,000 child RMEG
			21,000 adult RMEG
Bromoform	Not Detected	-	200 child RMEG
			700 adult RMEG
Dibromochloromethane	Not Detected	-	900 child Chronic EMEG
			3,200 adult Chronic EMEG
Diethyl phthalate	1.63	-	8,000 child RMEG
			28,000 adult RMEG
Phenol	Not Detected	-	3,000 child RMEG
			11,000 adult RMEG
Methyl-T-butyl ether (MTBE)* *Lab Report listed as: tert-butylmethylether	78.9	-	3,000 child Intermediate EMEG
			11,000 adult Intermediate EMEG

µg/L = microgram per liter; ATSDR = Agency for Toxic Substances and Disease Registry; HCV = Health Comparison Value; J = Analyte detected below quantitation limit; B = Analyte detected in the associated method blank; RMEG = Reference Dose Media Evaluation Guides; CREG = Cancer Risk Evaluation Guide; Chronic EMEG = Environmental Media Evaluation Guides with exposure lasting greater than 365 days; Intermediate EMEG = Environmental Media Evaluation Guides with exposure between 14 – 365 days. NOTE: Values in bold represent an exceedance of the ATSDR HCV.

**Table 2.** Summary of Theoretical Risk Calculations Using the Reported Benzene Exposure Point Concentration

Compound	Reported Concentration (micrograms per liter - µg/L)	Estimated Daily Exposure Dose (milligrams per kilograms per day - mg/kg/day)	Hazard Quotient (HQ) (unitless)	Cancer Risk (CR) (unitless)
Benzene	<b>0.67</b>	0.000096	0.2	$4.8 \times 10^{-7}$

NOTE: Values in bold represent an exceedance of the ATSDR HCV; ATSDR = Agency for Toxic Substances and Disease Registry; HCV = Health Comparison Value.

## **Community Health Concerns**

ADH attended a meeting on April 12, 2014, held at the Living Word Church of God In Christ, 2109 Main Street, Crossett, AR 71635. This meeting was requested by the community group, ‘Concerned Citizens for Environmental Justice’. The EPA Region 6 DRA and OEJTA staff had previously communicated with this group on several occasions, and discussions prompted EPA to visit the community. EPA agreed to attend the April 2014 meeting and facilitate communication between the community and other stakeholders. EPA requested personnel from ADH, ADEQ, and the City of Crossett Public Drinking Water to attend and present agency-specific environmental information. Another attendee at the community meeting spoke on behalf of the Louisiana Environmental Action Network (LEAN).

The audience included Crossett citizens; church attendees; members from ‘Concerned Citizens for Environmental Justice’, Ouachita Riverkeeper, and LEAN; an Arkansas State Representative for Ashley County, and a newspaper reporter. Also present at the meeting was a film crew working for Penn Road Productions (Act 4 Entertainment) that filmed the entire meeting for the purpose of producing a film about the Crossett community. The film crew participated during the meeting discussions and has collaborated with members of the ‘Concerned Citizens for Environmental Justice’ group prior to the April 2014 meeting.

ADH personnel presented findings of the data review of the public water systems and health outcome data, both discussed in this health consultation. At the conclusion of the meeting, it was agreed upon that all federal and state agencies would continue to work with the community and in cooperation with GP in order to further identify and clarify environmental issues of concern. At the time of this review, another community meeting, along with an air monitoring study was proposed for future communication between all concerned parties.

## **Child Health Considerations**

While evaluating public water systems and health outcome data from Crossett and Ashley County, the individual child exposure was considered because of the following factors (*i.e.*, physical differences between children and adults may require special emphasis, as determined by site-specific cases.) Because children are shorter than are adults, they breathe dust, soil, and vapors close to the ground, which could put them at greater risk than adults from certain kinds of exposure to hazardous substances. A child’s lower body weight and higher intake rate results in a greater dose of hazardous substance per unit of body weight. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. Children depend on adults to identify risks. Therefore, adults need as much information as possible to make informed decisions regarding their children’s health.



For this health consultation, both the child and adult drinking water health comparison values were compared to the tap water laboratory results provided to ADH by EPA (as shown in Table 1). The tap water concentrations reported were well below child (and adult) health comparison values. Additionally, cancer data analysis completed included both child and adult cases (see Appendix B).

## **Health Outcome Data**

When area residents expressed health concerns from their surrounding community, the ADH Cancer Epidemiology Section evaluated all cancer data for Ashley County and compared them with the cancer data for the state of Arkansas. Ashley County was used as the exposure area and the state of Arkansas was chosen as the reference population to assess possible excess cancer incidence at the county level. County level data may be a limitation in this type of analysis, because the size of the potentially exposed population is likely to be much smaller than the county level population. But, because of Ashley County's dense population, mostly residing in and surrounding the Crossett area, county rates are likely representative of the population in and around Crossett. Based on a statistical evaluation of cancer incidence and cancer mortality rates in Ashley County and the state of Arkansas, it was determined that there is no significant difference to indicate elevated cancer cases when comparing health outcome data.

A full analysis of the health outcome data can be seen in Appendix B.

## **Conclusion 1**

ADH and ATSDR conclude that substances (analytes) present in the public drinking water systems are not expected to harm people's health and pose no risk to public health. The exposure pathway for drinking water is eliminated since no contamination has been detected at levels of public health concern in the drinking water supplies.

## **Conclusion 2**

ADH and ATSDR conclude there is no significant difference to indicate elevated cancer cases for Ashley County as compared with the state of Arkansas.

## **Recommendations**

For the community surrounding the GP paper mill site in Crossett, Arkansas, ADH and ATSDR recommend the following:

- Seek public information from the ADH Local Health Unit (LHU) (phone number, 870 – 364 – 2115) to increase their awareness of cardiovascular disease and potential stroke-related factors leading to illness or death. If community members or their household contacts are concerned about cardiovascular disease or related symptoms, they should be encouraged to see a physician or seek medical care [See Appendix B and C].

- Seek assistance from federal and state agencies (EPA, ADEQ, ADH) on how to access relevant information regarding water or air data, as needed or requested.

## **Public Health Action Plan**

The purpose of the Public Health Action Plan (PHAP) is to ensure that this health consultation not only identifies any public health hazards, but also provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. The PHAP implemented by ADH and ATSDR with regards to the community surrounding the GP paper mill in Crossett, Arkansas, is as follows:

### **Completed Actions**

- ADH and ATSDR program personnel, along with the ADH Cancer Epidemiologist and LHU representative, conducted a site visit of the GP facility, waste water treatment plant, and adjacent community tour (February 8, 2012).
- ADH responded to a request from EPA Region 6 to assist in public health evaluation at the site (March 2014).
- ADH attended the community meeting held by ‘Concerned Citizens for Environmental Justice’ and facilitated by EPA and answered questions regarding potential adverse health effects from exposure to possible environmental contaminants in drinking water. ADH personnel that attended the meeting included, epidemiologists, a public information officer, an engineer, a public health physician and the LHU administrator (April 12, 2014).
- ADH LHU hosted a stroke awareness-specific health fair in Ashley County (May 15, 2014). Blood pressure machines and blood pressure awareness and education stations were set up in the Wilmot, Montrose, Hamburg, and Crossett communities within Ashley County. Local advertisements for these health fair and screening stations were run in the area newspapers. This was part of the community health education outreach efforts, as requested by EPA at the public meeting.

### **Future Activities**

- ADH and ATSDR will continue to provide public health evaluation of future environmental data (drinking water) and assistance to federal and state agencies in regards to this site, as needed or requested.
- ADH and ATSDR will continue to provide education to the public and address community members’ requests or concerns in regards to this site, as needed or requested.

- ADH and ATSDR will review any additional environmental sampling data provided by EPA, ADEQ or other stakeholders, and write a follow-up health consultation document, as needed or requested.

## **REPORT PREPARATION**

This Health Consultation for the ‘Review of Community Drinking Water and Health Outcome Data in Response to Community Requests of Residents Near the Georgia-Pacific Corporation Crossett Paper Operations’ was prepared by the Arkansas Department of Health (ADH) under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with the approved agency methods, policies, procedures existing at the date of publication. Editorial review was completed by the cooperative agreement partner. ATSDR has reviewed this document and concurs with its findings based on the information presented.

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## References

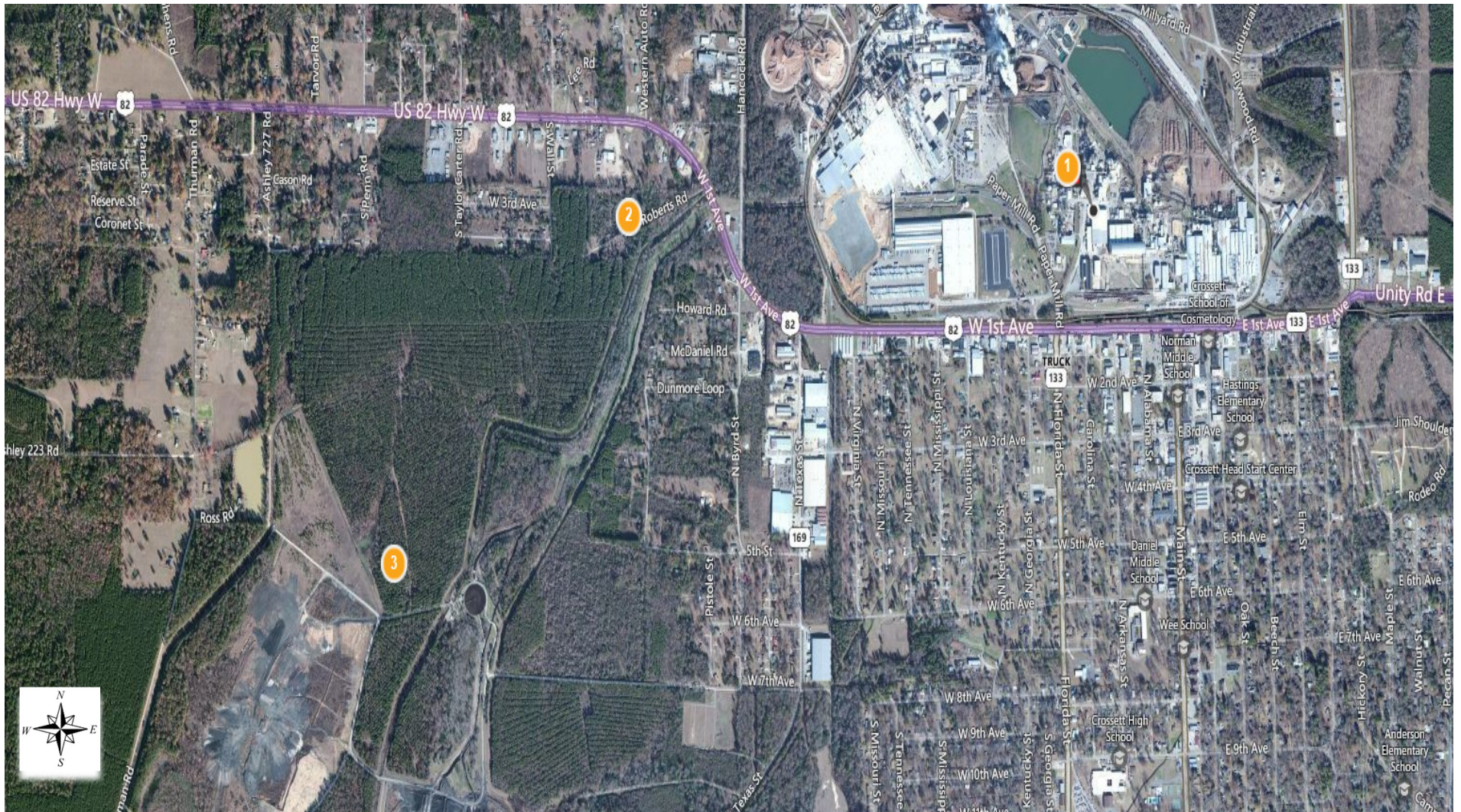
1. Georgia Pacific Corporation website, website found at:  
<http://www.gp.com/Company/Company-Overview/Locations/Crossett.aspx>.  
Accessed June 2014.
2. U.S. Environmental Protection Agency, Resource Conservation and Recovery Act (RCRA), Compliance Evaluation Inspection Report. April 10, 2012.
3. U.S. Census Bureau, 'State and County QuickFacts' for Crossett, Arkansas, website found at: <http://quickfacts.census.gov/qfd/states/05/0516240.html>. Accessed June 2014.
4. Terracon Consultants, Inc., "Second Half 2014 Groundwater Monitoring Report" for Georgia Pacific LLC Crossett Paper Operations Class 3N Landfill; AFIN 02-00013. February 10, 2015.
5. U.S. Environmental Protection Agency, Review of Public Drinking Water Systems Near Crossett, Arkansas, Email correspondence. March 2014.
6. Arkansas Department of Health, Review of Public Drinking Water Systems in Crossett, Arkansas (Analytical Data 2003 to 2014), Email correspondence. March 14, 2014.
7. U.S. Environmental Protection Agency, 2012 Edition of the Drinking Water Standards and Health Advisories; EPA 822-S-12-001; April 2012.
8. Institute of Medicine (IOM). 2010. Dietary Reference Intakes Tables and Application. Online.  
<http://www.iom.edu/Home/Global/News%20Announcements/DRI>
9. US EPA, 2003. Drinking Water Advisory: Consumer Acceptability Advice and Health Effects Analysis on Sodium. Online at:  
[http://water.epa.gov/action/advisories/drinking/upload/2003\\_03\\_05\\_support\\_cc1\\_sodium\\_dwreport.pdf](http://water.epa.gov/action/advisories/drinking/upload/2003_03_05_support_cc1_sodium_dwreport.pdf)
10. US EPA. 2013a. National Primary Drinking Water Regulations. Online.  
<http://water.epa.gov/drink/contaminants/index.cfm#List>
11. Ana-Lab Corp. Analysis Report; Project 594466; 32 pages. December 20, 2012.

12. Agency for Toxic Substances and Disease Registry, Final Comparison Value Guidelines: Drinking Water Comparison Values. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service. March 2014.
13. Agency for Toxic Substances and Disease Registry, Toxicological Profile for Benzene (*Update*). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service. 2007.
14. U.S. Environmental Protection Agency, Exposure Factors Handbook. 2011.

**Appendix A: Figure of Distance between Georgia Pacific Properties and  
Community Areas**



Georgia-Pacific Corporation Crossett Paper Operations  
Crossett, Ashley County, Arkansas



Source: MSN Maps;

<http://www.bing.com/maps/default.aspx?form=MSNNAV&ref=67BD33CAB2924BB283FD8818A6D2A34E#Y3A9MzMUMTMT0MTYzfi05MS45ODE2MjUmbHZzPTElJnN0eT1oJnJ0cD1hZHIufnBvcy4zMzY4MzgzODNBfLTKxLjk2NTM2MF9fX19hXyZtb2RlPUQmcnRvcD0wfjB+MH4=>

Approximate locations: 1 = Georgia Pacific Paper Mill Facility; 2 = Roberts Road; 3 = Georgia Pacific Waste Water Treatment Plant property.



## **Appendix B: Health Outcome Data**

Health outcome data identify certain health conditions that occur in populations. These data can provide information on the general health of communities living near a chemical plant or hazardous waste site. They also can provide information on patterns of specified health conditions. Some examples of health outcome databases are tumor registries and vital records. Information from local hospitals and other health care providers can also be used to investigate patterns of disease in a specific population.

### **Cancer Registry Data Review**

The Centers for Disease Control and Prevention (CDC) defines a cancer cluster as a greater than expected number of cancer cases that occurs within a group of people in a geographic area over a defined period of time [1]. Because cancer is common, cases might appear to occur with alarming frequency within a community even when the number of cases is within the expected rate for the population. As the U.S. population ages, and as cancer survival rates continue to improve, in any given community, many residents will have had some type of cancer in their lifetime, thus adding to the perception of an excess of cancer cases in a community. Multiple factors affect the likelihood of developing cancer, including age, genetic factors, and lifestyle behaviors such as diet and smoking. Also, a statistically significant excess of cancer cases can occur within a given population without a discernible cause and might be a chance occurrence.

Using methods from the protocol, *ADH Guidelines for Investigating Clusters of Chronic Diseases*, and the ADH Arkansas Central Cancer Registry data, overall cancer incidence (i.e., morbidity) and cancer incidence for specific primary organ types were calculated from 1997 through 2010 for Ashley County and statewide [2]. The cancers of concern were expressed in the media and online videos; therefore, ADH analyzed data for all cancers combined, all respiratory cancers, and more specifically, lung and bronchus cancer. Review of this data also led to more closely examining the leading causes of death in Ashley County. Ashley County was used as the exposure area because when a more defined area of exposure via the zip codes and census block groups were examined, the case count numbers were too low and displayed too much variance. The state of Arkansas was chosen as the reference population to assess possible excess cancer incidence in Ashley County as defined in the ADH guidelines. County level data was the best, readily available, resource to explore possible elevated cancer risk in the surrounding area. The geographic unit (county level) available to evaluate the health outcome data may be a limitation in this type of analysis given that the size of the potentially exposed population is likely to be much smaller than the county level population. However, due to the population density of Ashley County, mostly residing in and surrounding the Crossett area, the rates for the county are likely representative of the population in and around Crossett. According to the U.S. Census, the 2008-2012 five-year estimated population of Ashley County was 21,811. The area of Crossett covers three census tracts, 9605 (North Crossett), 9606 (Crossett), and 9607

(West Crossett), and combined they had an estimated population of 10,530, during the same years; which is approximately 48% of the population of Ashley County [3].

Age-standardized rates allow comparisons between populations without the influence of age. As such, a diagnosed-to-expected ratio was calculated by dividing the number of cancers diagnosed in the area by the number of expected cases. This ratio is called a standardized incidence ratio (SIR). The SIR is a ratio of the number of observed cancer cases in the study population to the number that would be expected if the study population experienced the same cancer rates as an underlying population (often called the "reference" population). An SIR of 1.0 indicates that the number of cancer cases diagnosed in Ashley County is the same as the number of cancer cases expected. If the SIR is greater than one, more cancer cases than expected were diagnosed in Ashley County. To determine if the number of diagnosed cases is significantly greater than the expected number, a confidence interval (CI) was calculated for each SIR. A confidence interval is calculated to determine the precision of the SIR estimate and the statistical significance. If the confidence interval includes 1.0, the SIR is not statistically significant. The narrower the confidence interval, the more confidence one has in the precision of the SIR estimate. One difficulty in cancer cluster investigations is that the population under study is generally a community or part of a community, typically resulting in a small denominator. Small denominators frequently yield wide confidence intervals, meaning that the SIR is, therefore, not as precise as desired [1]. Cancer incidence by primary organ type for Ashley County, as well as statewide, from 1997 to 2010 can be found in **Table 1**.

<b>Table 1. Cancer Incidence for Ashley County and Arkansas, 1997-2010</b>						
	<b>Arkansas Overall</b>		<b>Ashley County</b>			
<b>Cancer Type</b>	<b>Cases</b>	<b>Age-adjusted rate (per 100,000)</b>	<b>Cases</b>	<b>Age-adjusted rate (per 100,000)</b>	<b>SIR*</b>	<b>SIR CI*</b>
<b>All Cancers</b>	190,897	451.0	1720	462.2	1.02	(0.98-1.07)
1997-2010						
<b>All Respiratory Cancers</b>	36,990	86.0	333	87.6	1.02	(0.91-1.13)
1997-2010						
<b>Lung &amp; Bronchus</b>	34,509	80.1	312	81.9	1.02	(0.94-1.18)
1997-2010						
<b>Source: Arkansas Central Cancer Registry, CancerCORE system, accessed June 3, 2014</b> <b>* SIR denotes Standardized Incidence Ratio, CI denotes 95% Confidence Intervals</b>						

Based on the analysis using the data from the Arkansas Central Cancer Registry, small elevated risks (values above 1.0, as seen by the SIR) were observed for all cancers combined, as well as cancers of respiratory system, and lung and bronchus cancer in Ashley County. However, the 95% CI for each SIR result does not indicate this slight elevation is statistically significant. As a group, cancers are very common. Cancers are the second leading cause of death in the U.S. and Arkansas, exceeded only by diseases of the heart. According to the American Cancer Society (or ACS), about one in two men and one in three women will develop cancer in their lifetime [4]. Cancer is not one disease, but a group of more than 100 diseases with different causes, and it can take many years to decades to develop.

Causes of cancer range from lifestyle factors such as tobacco use, poor nutrition, physical inactivity, obesity, excessive sun exposure, and certain types of infections and medical treatments and family history of disease. Considering this and the cancer concerns expressed, we examined tobacco use in the area, which increases the risk of many cancers including respiratory and lung and bronchus cancers. **Figure 1** shows the prevalence of current smokers in Ashley County and the state overall from 2004 - 2012. Based on the available data, the rates of smoking among those living in Ashley County have remained higher than the overall smoking rates in the state, with the exception of year 2010. Note that a small sample size of respondents increases the variability of the smoking estimates, which is indicated by the annual differences at the county level.

Exposure to carcinogenic agents in occupational, community, and other settings is thought to account for a relatively small percentage of cancer deaths, about 4% from occupational exposures and 2% from environmental pollutants (man-made or naturally occurring) [4].

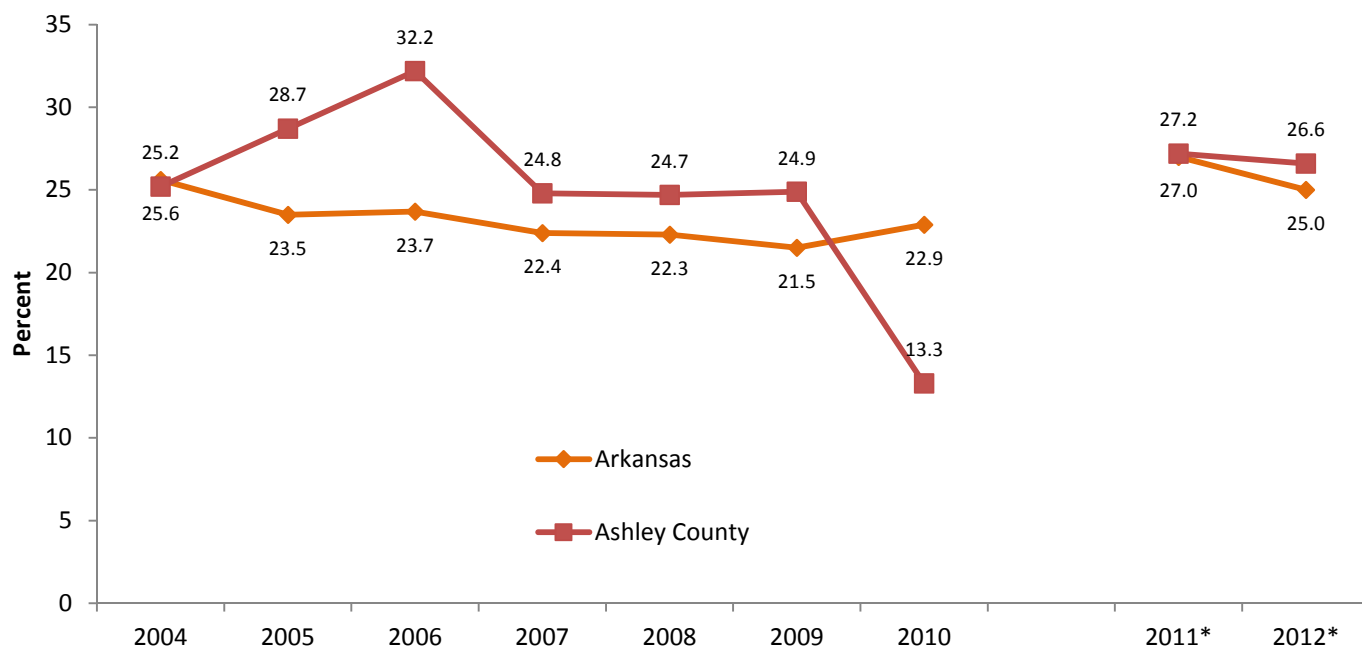
### **Limitations**

Although age can be accounted for, information on years of residence and occupation of patients with these cancers in Ashley County is limited. Cancers reported to the cancer registry only list the patient's current residence at the time at diagnosis. Since there is a long latency period (i.e., time from initial exposure to development of disease) for most of the cancers, it is important to have historical residential information of the patients with cancer. Additionally, information about direct past exposure to the contaminants of concern (COCs) associated with the Georgia Pacific site for each individual is limited.

As previously stated, the geographic unit (county level) used to evaluate the health outcome data may be a limitation in this type of analysis given that the size of the actually exposed population is likely to be much smaller than the county level population. However, since nearly half the population in Ashley County resides in the Crossett area, the rates are considered to be representative of the Crossett community [3].

Elevated cancer rates alone cannot be considered conclusive evidence that living near a chemical plant or waste site is the sole cause for the occurrence of a specific disease. These types of diseases are based on many variables. Also, data indicates there is a higher prevalence overall of smoking in Ashley County as compared to the state. See Figure 1, below.

**Figure 1. Prevalence of Current Cigarette Smoking among Adults  
Ashley County & Arkansas, 2004 - 2012**



Respondents aged  $\geq 18$  years who report having smoked 100 cigarettes in their lifetime and are current smokers on every day or some days. Source: Arkansas Department of Health, Behavioral Risk Factor Surveillance System (BRFSS)

\*2011 and 2012 data are not comparable to previous years because of survey methodological changes. Note: Ashley County results are based on estimates from state-level data. Ashley County results for years 2011-2012 are based on BRFSS results from *Population Health Metrics 2014*, 12(5) 2-13.

### **Leading Causes of Death**

In Arkansas, the mean life expectancy at birth was 75.9 years using 2008-2010 death data and 2009 population estimates [5]. In Ashley County, the life expectancy using the same data (74.9

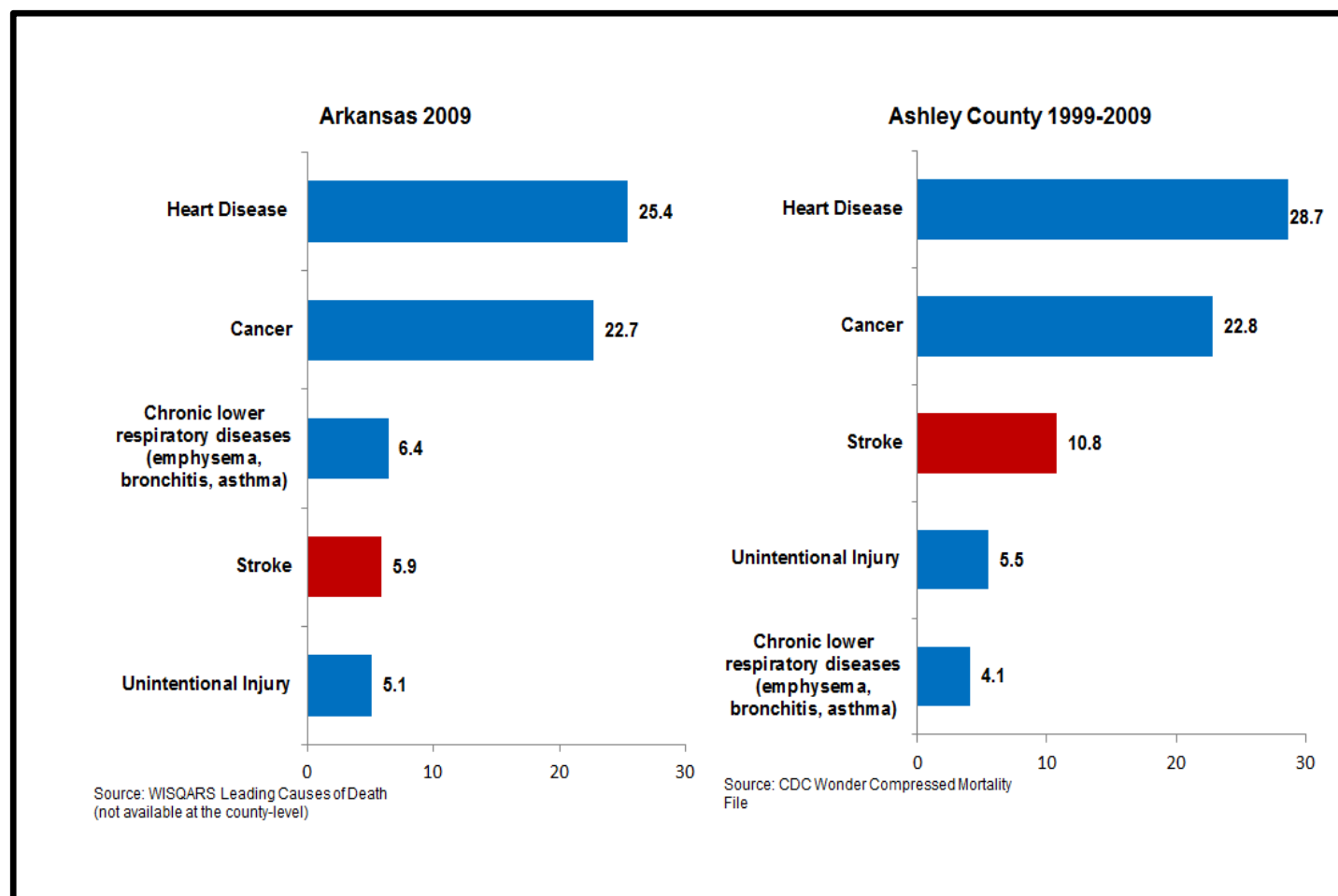
years of age) was only one-year less than the state mean. When reviewing the leading causes of death in Ashley County as compared to the state, heart disease and cancer were the top two leading causes in Arkansas and Ashley County, and the distribution of these deaths were similar. However, stroke was the third leading cause of death in Ashley County and the fourth leading cause of death in Arkansas, and the percentage of stroke deaths in Ashley County was 83% higher than the percentage of deaths observed in the state. For more information about stroke death data, see Appendix C.

### **Appendix References**

1. Centers for Disease Control and Prevention. Investigating suspected cancer clusters and responding to community concerns: Guidelines from CDC and the council of state and territorial epidemiologists. <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr6208a1.htm>. Accessed May 6, 2014.
2. Arkansas Department of Health. Guidelines for investigating clusters of chronic diseases. <http://www.healthy.arkansas.gov/programsServices/healthStatistics/CancerRegistry/Documents/GuidelinesChronicDiseaseClusters.pdf>.
3. U.S. Census Bureau. <http://factfinder2.census.gov/>. Accessed June 12, 2014.
4. American Cancer Society. Cancer facts and figures, 2014. <http://www.cancer.org/research/cancerfactsstatistics/cancerfactsfigures2014/>. Accessed May 6, 2014.
5. ADH Health Statistics Branch. Life expectancy in Arkansas. <http://www.healthy.arkansas.gov/programsServices/healthStatistics/Documents/LifeExpectancy/2009LifeExpectancyMap.pdf>. Accessed May 20, 2014.

**Appendix C: Figure and Stroke Data Presented at Public Meeting on April  
12, 2014 in Crossett, AR**

**Figure. Leading Causes of Death (All Ages), Arkansas 2009 and Ashley County 1999-2009**





### **Stroke Death Data Review**

Arkansas is ranked first in the nation for stroke mortality [1]. Ashley County and surrounding Arkansas Delta counties tend to have higher stroke death rates than the state. Age-standardized stroke death rates were reviewed for the most recent years of data available, 1999 – 2010, for Arkansas and Ashley County. County level is the smallest unit of stroke mortality data available for analysis from the CDC [2]. The overall stroke death rate for Arkansas during combined years 1999-2010 was 65.3 per 100,000 population (95% CI: 64.4 – 66.1). The stroke death rate for Ashley County during those same years was significantly higher at 106.4 per 100,000 population (95% CI: 94.9 – 118.0).

According to the CDC and the National Stroke Association, risk factors for stroke include age (risk doubles every decade after age 55), alcohol use (more than 2-drinks per day among men and 1-drink per day among women), tobacco use, high blood pressure, high cholesterol, obesity, physical inactivity, a diagnosis of diabetes, and a diagnosis of sickle cell disease [3, 4].

During the cancer evaluation, statistics for the leading causes of death were also examined. While the cancer rates were similar in Ashley County and the state, it was observed that stroke rates were the third leading cause of death in Ashley County and the fourth leading cause of death in Arkansas. Additionally, the percentage of stroke deaths in Ashley County was 83% higher than the percentage of deaths observed in the state.

### **Appendix References**

1. Arkansas Department of Health. The burden of heart disease & stroke, Arkansas. 2012.
2. Centers for Disease Control and Prevention. CDC wonder compressed mortality. <http://wonder.cdc.gov/>. Accessed November 1, 2013.
3. Centers for Disease Control and Prevention. Risk factors for stroke. [http://www.cdc.gov/stroke/risk\\_factors.htm](http://www.cdc.gov/stroke/risk_factors.htm). Accessed May 19, 2014.
4. National Stroke Association. Stroke risk factors. <http://www.stroke.org/site/PageServer?pagename=riskfactors>. Accessed June 11, 2014.